STAUFFER CHEMICAL COMPANY SITES

Stauffer Chemical Company - Cold Creek Plant
Stauffer Chemical Company - LeMoyne Plant

AXIS AND BUCKS, MOBILE COUNTY, ALABAMA

INITIAL 5-YEAR REVIEW
FOR
OU-1, GROUND WATER OPERABLE UNIT

PREPARED FOR:

U. S. ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

PREPARED BY:

U. S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
109 ST. JOSEPH STREET
MOBILE, ALABAMA 36602

EPA Five-Year Review Signature Cover

Key Review Information

Site Identification			
Site Name: **Stauffer Chemical Company (Cold Creek Plant) Site** **Stauffer Chemical Company (LeMoyne Plant) Site**			**EPA ID:** **ALD 095 688 875** **ALD 008 161 175**
Region 4:	**State: AL**	**City/County: Axis & Bucks, Mobile County**	
Site Status			
NPL Status: **Proposed: 9/8/1983 Finalized: 9/21/1984**			
Remediation Status: Operating			
Multiple OU's* Y		Number of OU's: 3	
Construction Completion Date:			
Fund/**PRP**/Federal Facility lead: **PRP**		Lead Agency: EPA Region 4	
Has site been put into reuse? N			
Review Status			
Who conducted the review? U.S. Army Corps of Engineers			
Author name: Ernest R. McCollum		Author title: Geologist	
Author affiliation: U.S. Army Corps of Engineers, Mobile District			
Review Period: May 24, 1999-			
Highlight: Statutory Policy		Policy type:	Review number: 1
Triggering action event: 5 years since completion of ground water extraction system			
Trigger action date: 8/18/1993		Due date: September 30, 1999	
* "OU" refers to Operable Unit			

Deficiencies:

Five deficiencies were observed during the site inspection. Minor deficiencies were unlocked wells and unlabeled wells, which do not affect protectiveness. The other two deficiencies involve the failure to monitor the effectiveness of the system as required by the ROD.

- All monitoring wells at Cold Creek (Zeneca) and CNA do not have locking steel protective casings or bollards;
- Monitoring wells at some locations are not labeled with well numbers, date drilled, depth, etc.;
- Monitoring wells are not being used to monitor the system to determine its' effectiveness and to verify plume capture;
- Monitoring wells are not being sampled to verify the progress of the cleanup.
- Shutting down extraction well system at Akzo Nobel to collect samples from MW-19 & MW-20

Recommendations and Required Actions:

Eleven recommendations are made in the report:

- Redevelop and function test all monitoring wells;
- Collect a complete round of ground water level measurements and construct a potentiometric map of the sites;
- Use the new data to calibrate the ground water model (MODFLOW) and check model predictions;
- Designate detection monitoring/ POC wells;
- Start quarterly collections of ground water levels on all, or selected, wells and maintain current plots of readings and an updated potentiometric map. All water levels should be collected on the same day;
- Institute a quarterly sampling program for POC wells;
- Install dedicated samplers at MW-19 & MW-20 so that extraction system does not have to be shut down. Take blank samples of deionized water to the field and open containers while sampling MW-19 & MW-20 with system operating, analyze DI samples for contamination;
- Institute a review program to see if any monitoring wells can be closed/abandoned;
- At the next scheduled maintenance install a drop tube in well CC-14;
- Maintain access to wells in Cold Creek Swamp, and;
- Locate, label and protect monitoring wells on CNA property.

Protectiveness Statements:

The remedy at OU-1 appears to be protective of human health and the environment. The water level data collected as a part of this site inspection indicates that the system maintains an inward gradient and appears to be capturing the plume. Without any long term water level

data or any monitoring well sample data it is not possible to evaluate the performance of the system.

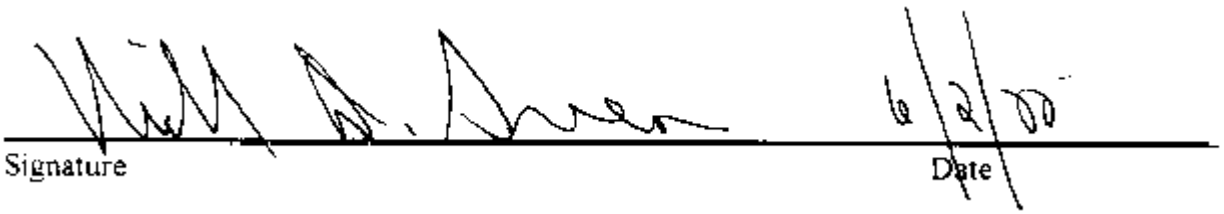
Other Comments:

Because the ROD was signed before all the Remedial Investigations and Remedial Design were completed, the ROD does not communicate that there are three actual pump and treat systems at the sites. One system is comprised of extraction wells IW-1 through IW-4 and the Ground Water Improvement Pond, another system is IW-5 (Halby Pond) and its discharge to the waste water treatment plant, and the third system is well CC-14 and its associated carbon adsorption system.

Another issue that needs to be addressed is who will be responsible for the wells on the Courtaulds North America (CNA) property, now known as Acordis Cellulosics. These wells were installed when Stauffer Chemical Company (SCC) owned the sites. CNA granted SCC an easements to install the wells. The present owners of the SCC property, Zeneca and Akzo Nobel, do not claim ownership of the wells and CNA does not own the wells. These wells are deteriorating and need to be protected. Also, these wells are extremely important in determining the effectiveness of the remediation, and they are the off-site wells.

A review of the water levels collected as a part of the site inspection indicates that the pump and treat systems appear to be capturing the plume, but a more detailed investigation needs to be completed to insure that the plume is being captured. Based on the water level review the system was called protective. However, as the deficiencies and recommendations indicate the system is not being monitored correctly and the protectiveness is just fortuitous.

Signature of EPA Region 4, Waste Management Division Director and Date



STAUFFER CHEMICAL COMPANY SITES

Stauffer Chemical Company S Cold Creek Plant
Stauffer Chemical Company S LeMoyne Plant

AXIS AND BUCKS, MOBILE COUNTY, ALABAMA

INITIAL 5-YEAR REVIEW

FOR OU-1, GROUND WATER OPERABLE UNIT

Table of Contents

I. INTRODUCTION

This 5-year review is to evaluate the performance of the remediation system installed for Operable Unit One (OU-1), the ground water operable unit, at the Stauffer Chemical Company Sites. The Cold Creek Plant site and the LeMoyne Plant site were placed on the National Priorities List (NPL) in September 1983 and were ranked number 221 and number 467, respectively. Past disposal practices at both sites resulted in ground water contamination, that was discovered in the early 1970's when contaminants were detected in on-site and off site wells.

The purpose of the 5-year review is to determine if the site remedy is protective of human health and the environment. In addition to the findings and conclusions of the reviews, deficiencies are identified and corrective actions are recommended. This is the initial 5-year review for the Stauffer Chemical Company Sites.

This review is required by statute. The United States Environmental Protection Agency (EPA) must implement five-year reviews consistent with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). CERCLA ö121(c), as amended, states:

> If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented.

The NCP part 300.430(f)(4)(ii) of the Code of Federal Regulations (CFR) states:

> If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.

II. SITE CHRONOLOGY

Table 1 lists the chronology of events for the Stauffer Chemical Company Sites.

TABLE 1
SITE CHRONOLOGY

1970'S	Contamination found in wells
1973	Install Monitor Wells
1977	Hydrogeologic Investigation

1980	Install Pump and Treat System
1982	Site Assessment Alabama Dept. of Public Health
9/83	NPL Listing
5/85	Camp, Dresser & McKee does initial sampling
10/9/1986	RCRA Permit becomes effective
5/88	Akzo/ICI complete RI
7/88	Draft FS report submitted, requires modifications
9/27/89	ROD
4/25/90	Consent Order
5/4/90	FS Report accepted
9/7/90	RD Work Plan
1/92	Preliminary Design Report
7/14/92	Final Phase II Intercept Well Design Report
12/10/92	IW-4, I W-5 & CC-14 Installed
1994	Remedial Action completed
June – August 1999	First 5-Year Review

III. BACKGROUND

The Stauffer Chemical Company sites, LeMoyne plant and Cold Creek plant, are located approximately 20 miles north of Mobile, Alabama on U. S. Highway 43. The LeMoyne plant manufactures multi-product organic and inorganic chemicals including carbon disulfide, sulfuric acid and Crystex®, a proprietary sulfur compound. Past production at the plant included carbon tetrachloride, chlorine, and caustic soda (sodium hydroxide). Agricultural pesticide and herbicides, including thiocarbamates, are manufactured at the Cold Creek plant.

The LeMoyne plant started operations in 1953 under the ownership of Stauffer Chemical Company (SCC) and is currently owned by Akzo Nobel. From 1965 to 1974 while owned and operated by SCC, waste from the plant was placed in an unlined landfill located on the eastern side of the property. The waste included brine muds, plant refuse, used samples, and absorption oil. The LeMoyne landfill was closed in 1975 with an impermeable membrane cap and side-wall liner.

Waste waters from the LeMoyne plant processes were held in ponds. All of the ponds, except for one with a membrane liner, were clay lined and are closed. The membrane lined pond is inactive but not closed. The currently used membrane lined ponds were installed in the 1970's to replace the closed and inactive ponds. The New Brine Mud Pond is regulated by a RCRA permit.

From 1965 to 1974, a small area on the western side of the LeMoyne plant was leased, by SCC, to the Halby Chemical Company (HCC), which manufactured dye chemicals including sodium hydrosulfide. Witco, Inc. purchased the HCC plant in 1974 and continued to operate

the plant until 1979. Waste products and effluent were held in an on-site pond and eventually discharged to the Cold Creek Swamp. The pond in now closed and filled.

The Cold Creek plant began operation in 1966 under the ownership of SCC and is currently owned by Zeneca. Until 1974, solid wastes were placed in two disposal sites referred to as the Cold Creek North and South Landfills. The wastes stored in the Cold Creek landfills were water treatment plant sludges, used sand blasting sand, generator coke, incinerator ash, and filtrate waste. The landfills were closed in 1974 with geomembrane caps and side wall liners. A clay-lined lagoon was used to store and neutralize waste water until 1975. The lagoon was closed in 1978 and replaced with a membrane lined lagoon that is still in use.

In the early 1970's, contamination was detected in on-site and off-site wells. The off-site wells are located on the adjacent Courtauld North America (CNA) property that is the southern boundary of the LeMoyne site. This property is now called Acordis Cellulosics. Due to the continued decline in the quality of the ground water, seven monitoring wells were placed along the southern boundary of the LeMoyne site to monitor ground water quality. In late 1980, three ground water extraction wells were installed along the southern boundary of the LeMoyne site. These wells discharged to an air stripper manifold system at the Ground Water Improvement Pond (GWIP). The system was approved by the Alabama Water Improvement Commission (AWIC), which is now the Alabama Department of Environmental Management (ADEM).

An assessment of both sites was conducted in 1982 by the Alabama Department of Public Health (ADPH) in response to submissions made by Stauffer to the House Committee on Interstate Commerce (the Eckhardt Survey). At ADPH's request, additional monitoring wells were installed around the Cold Creek Landfills. Data from the existing monitoring wells and the newly installed monitoring wells formed the basis for the EPA placing the sites on the National Priorities List (NPL), which ranks hazardous waste sites under the provisions of CERCLA. Both sites were transferred from the proposed list to the final NPL list in September 1983.

In November 1984, EPA Region IV sent a general notice letter to SCC notifying the company of potential liability for the contamination at the SCC sites. Camp, Dresser and McKee, Inc. (CDM), under contract to the EPA, performed preliminary sampling in May 1985 to assist in preparation of a Work Plan for the Remedial Investigation/Feasibility Study (RI/FS). The SCC contracted to conduct the RI/FS under a consent agreement with the EPA, and Akzo/ICI completed the RI in May 1988. A draft FS report was submitted by Akzo/ICI in July 1988. The EPA required modifications to the report in letters sent in September and November 1988 and January 1989. A final FS report was submitted in June 1989. This report was reviewed by EPA and was partially disapproved. An amended final FS report was submitted to EPA in April 1990. EPA approved the amended final FS report , with respect to the ground water operable unit (OU-1), on May 4,1990. The results of the RI/FS indicated that:

- Several ponds containing contaminated soils and/or sludges are located at the sites, and

- Ground water contaminated with carbon tetrachloride, carbon disulfide, thiocarbamates, and thiocyanate is present on the LeMoyne site. Thiocarbamates were detected in the ground water at the Cold Creek Site.
- Carbon tetrachloride, carbon disufide, and thiocarbamates were found in wells at the adjacent CNA property.

Community interest in the SCC Sites has been limited. Several news articles concerning the sites have been printed in the Mobile Press Register and the Advertiser. A Community Relations Plan was completed in September, 1985. On July 13, 1989, documents related to remedy selection at the sites, including the RI/FS Study and Proposed Plan, were made available by the EPA to the public at the Region 4 EPA offices in Atlanta, Georgia and the Toulminville Branch Library in Mobile, Alabama. This began a 30-day public comment period to solicit public opinion on the proposed remedial action at the SCC Sites. A public meeting was conducted on July 27, 1989, at which EPA presented the RI/FS report and Proposed Plan and answered citizens' questions. The Mobile County Commissioners and County Administrator were briefed prior to the meeting.

On September 27,1989, EPA issued the Record of Decision (ROD) for Operable Unit One, and on April 25, 1990, a Consent Order executed by Akzo, ICI and the United States was entered by the U.S. District Court for the Southern District of Alabama. The Consent Order addresses remedial design/remedial action (RD/RA) for OU-1 and incorporates the ROD and the Statement of Work for the RD/RA tasks. The RD component of the work is described in the RD Work Plan for the SCC Sites which was submitted to the EPA on September 7, 1990, (Geraghty & Miller, Inc. 1990). Included in the RD Work Plan is the Scope of Work for the ground water modeling. The results of the ground water modeling studies identified the requirements for three additional ground water extraction wells; two at LeMoyne, IW-4 and IW-5, and one at Cold Creek, CC-14. The ground water modeling was also used to select the pumping rates for the extraction wells. The remedial actions were completed in 1994 by the Potentially Responsible Parties (PRP's) , with EPA oversight. Additional source removals are planned at the Old Neutralization Pond (Cold Creek Site) and at the Halby Pond (LeMoyne site).

IV. REMEDIAL ACTIONS

A. Remedy Selection

The ROD for the Ground Water Operable Unit at the Stauffer Chemical Company Sites was signed on September 27,1989. The ground water operable unit is the initial operable unit at the Stauffer sites. Site specific OU-2 is comprised of the Solid Waste Management Units (SWMU's) such as the Cold Creek Old Neutralization Pond and Halby Pond. Cold Creek Swamp is OU-3. The selected remedy for OU-1 is to pump and treat the ground water and site monitoring of the ground water. The response actions for OU-1 were implemented to protect the public health and the environment by controlling the migration of contaminated ground water in the surficial aquifer, the primary source of water for industrial and domestic users located in the Mobile River Valley. The U.S. EPA has determined that

the off-site migration of contaminated ground water is one of the principal threats at these sites. The major components of the selected remedy are:

- Modify existing ground water intercept and treatment system; install additional monitoring (Detection Monitoring) and extraction wells,
- Continue extracting ground water from the surficial aquifer via existing and additional extraction wells,
- Monitor ground water movement at the site to determine the adequacy of the remedial action,
- Conduct treatability studies as appropriate for source treatment of RCRA Solid Waste Management Units and CERCLA disposal sites, and;
- Abandon wells no longer required for site monitoring

The ROD requires ground water monitoring at the sites for 30 years. The treatment system will be turned off when the ground water contamination has been reduced below the clean-up levels listed in the following Table2:

TABLE 2
GROUND WATER CLEANUP GOALS

Contaminant of Concern	**Goal (µg/L)**	Basis
Carbon Disufide	700	LHA
Carbon Tetrachloride	5	MCL
Cyanide	200	LHA
Mercury	2	MCL
Thiocyanates	200*	LHA
Thiocarbamate Herbicides**		
Butylate	350	LHA
Cycloate	7***	LHA
EPTC	210	LHA
Molinate	14	LHA
Pebulate	7***	LHA
Vernolate	7**	LHA

MCL – Maximum Contaminant Level
LHA – Lifetime Health Advisory, based on RfD 70 kg human w/ 2 liter/day water consumption, 20% relative source contribution
*- No Agency health-based number exists for thiocyanates. The LHA for the more toxic cyanide is used.
** - These cleanup goals could be increased a maximum of fourfold pending an EPA Office of Drinking Water decision to revise the LHA values for these carbamate herbicides that allows a drinking water source to contribute up to 80% of the RfD.
*** - No Agency-verified RfD's for these chemicals; the cleanup goal is based on the RfD for Vernolate (the most toxic carbamate at the site).

B. Remedy Implementation

The Remedial Design Work Plan was submitted on September 7, 1990, and the Preliminary Remedial Design Report was issued in Jan 1992. The ground water modeling performed during the preliminary RD was used to select the locations for the three additional intercept wells and the pumping rates for the extraction wells. The design was finalized in the Final Phase II Ground Water Intercept System at the Stauffer Chemical Company Sites report prepared by Geraghty & Miller and dated August 14,1992.

At the SCC sites there are three separate pump and treat systems and three treatment trains. One system is comprised of extraction wells IW-1, IW-2, IW-3, and IW-4 that discharge to the Ground Water Improvement Pond. The second system is IW-5, at the Halby Pond and its discharge system and the third system is well CC-14 and its associated treatment system

The basic Ground Water Intercept system consists of the three ground water intercept wells, IW-1, IW-2 and IW-3, and the Ground Water Improvement Pond (GWIP) installed in 1980, at the southern boundary of the LeMoyne site. These wells were installed to capture contaminated ground water at the site, prevent the migration of contaminated water off site and to capture contaminated ground water that had migrated south of the site onto the adjacent CNA property.

As a result of the remedial design, the system was modified to include intercept wells IW-4, down gradient of the LeMoyne Landfill, IW-5, near Halby pond, at the LeMoyne site and intercept well CC-14 at the Cold Creek site. These wells will help speed up the remediation process because they intercept the contaminated ground water close to the source area. The contaminated water does not have to be pulled across the site to the original intercept wells.

Intercept wells one through four discharge through the air stripper manifold system into the GWIP and finally to surface water. IW-5, at the Halby Pond, discharges to the plants waste water treatment plant and is eventually discharged to surface water. Well CC-14, at the Cold Creek site, discharges into a two column carbon treatment system and is discharged to surface water . The discharge streams for all of the extraction wells are monitored to insure that the requirements of the respective NPDES permits are not violated.

C. System Operations

Operation and maintenance of the systems at Cold Creek site (Zeneca) and LeMoyne site(Akzo) are performed by in-house staff. Both sites are active chemical plants and the required maintenance personnel are readily available.

At the Cold Creek Site the carbon adsorption system recently under went the first carbon reload and tank switch since the system went on line. The original carbon charge lasted 5 years before break through. The system design assumed an influent concentration of 200 ppb but the actual influent concentration is 20 ppb. The highest molinate concentration ever

recorded is 31 ppb. Criteria for the lead column is 5 ppb molinate, when effluent finally exceeded criteria the carbon in the lead tank was replaced and the lag tank became the lead tank. Each tank contains 20,000 pounds of carbon. The system is fed by extraction well CC-14, which discharges 150 gpm. The influent lines feeding the carbon columns are protected by particulate filters that are changed on a 4-day schedule. The used filters appear to be coated with an iron sludge. Because the system is not complex and the site is an operational chemical plant O & M funds are not budgeted for the system, but are included in regular operational costs. The system averages 3 or 4 down times per year and each down time is less than 24 hours. Estimated O & M expenses for Zeneca are 15 to 20 K yearly.

At the LeMoyne (Akzo) site system operation and maintenance site are also conducted by on-site personnel as a part of normal plant operations. Aside from mechanical break downs, the primary maintenance problem at the LeMoyne site is encrustation of the well screens in wells IW-1, 2 & 3 and the discharge pipeline for well IW-4. The screens in wells 1 thru 3 are encrusted with a carbonate material causing a loss of efficiency in the system. The LeMoyne Plant Groundwater Intercept and Treatment Systems Operations and Maintenance Plan, dated July 1, 1996, and revised September 5, 1996, has specific procedures for the acid cleaning of the wells and protocols for testing the gains in system efficiency after cleaning the well screens and pumps. IW-4 is affected by iron encrustation, particularly in the discharge line from the well to the GWIP. The discharge line has been equipped with clean out ports at 500 foot intervals along the line. It would be worth the effort to investigate why some wells are encrusted with carbonates and some with iron. The individual wells are equipped with non-totalizing flow meters which are read daily by the shift supervisor, well flows are totalized at the GWIP, with the possible exception of IW-4.

The inner liner of the GWIP has been damaged by the suction at the manifold system. ADEM and EPA Region 4 are aware of the damaged liner. To maintain a check on the integrity of the outer pond liner, monitoring wells MW-19 and MW-20 are sampled monthly. The rationale being that if contamination is discovered in these heretofore clean wells then the outer liner has failed. The rationale of sampling these wells is good, but the method of sampling has an adverse effect on the ground water remediation system. Extraction wells IW-1 thru IW-4 are shut down for one week per month for the well sampling. Monitoring wells MW-19 and MW-20 are located just downgradient of the GWIP and there is concern that if the air strippers were left in operation during the sampling event it is possible that the well samples could be cross contaminated by airborne VOC's from the air strippers. Like a construction dewatering system, the pump and treat system would be more effective if the system operated continuously. The wells are also purged three different times prior to sampling. The writer never clearly understood the rationale for the three purges of three well volumes. The system could be more efficiently operated if dedicated sampling pumps were installed in MW-19 & 20 and the system was not shut down monthly. The use of low flow purging and dedicated samplers should remove concerns over cross contamination, or the system could be shut down briefly for sampling after the well purging is completed.

The Cold Creek and LeMoyne Sites are operational chemical plants and proprietary products and processes are present at the sites. Site security is well maintained. Access to the sites

requires viewing a safety video, a signing in procedure and an escort while on site. The sites are well protected from vandalism and unauthorized access.

V. FIVE-YEAR REVIEW FINDINGS

A. Five-Year Review Process

The Stauffer Chemical Company Sites five-year review was lead by Mike Arnett and Annie Godfrey, EPA Remedial Project Managers for the Stauffer Chemical Company Sites. The five-year review consisted of the following activities: a review of relevant documents and a site inspection. The following persons attended the site inspection:

TABLE 3
SITE INSPECTION ATTENDEES

NAME	COMPANY	JOB TITLE	TELEPHONE
Steve Duym	Zeneca	Chemical Engineer	(334) 675-0950
Sylvia Williams	Akzo Nobel	Sr. Env. Engineer	(334) 679-4315
Mike Thompson	COE, Mobile	Env. Engineer	(334) 690-2709
Ross McCollum	COE, Mobile	Geologist	(334) 690-3113
Steve White	COE, HTRW-CX	Geochemist	(402) 697-2660
Brian Love	Akzo Nobel, SHERA	Principal Env. Eng.	(334) 679-4340
Laura L. Tate	COE, HTRW-CX	Chemical Engineer	(402) 697-2582
Terry Basset	Akzo Nobel	RA Manager	(334) 679-4209
Dennis Smith	Zeneca	Chemical Engineer	(334) 675-0950
Annie Godfrey*	USEPA	RPM	(404) 562-8919
Mariam Tehrani*	Akzo Nobel	Dir. Env. Affairs	(914) 674-5573

* Mariam Tehrani and Annie Godfrey participated by conference call.

B. Site Inspection

The initial meeting was held in the Zeneca conference room at 1 PM on July 6, 1999 and introductions were made. A short briefing on the 5-year review process was given. Since a large number of people were present it was decided to inspect the sites separately so that the employees of one company would not be involved in the inspection of another company. The personnel from Akzo Nobel returned to their plant and Mr. Dennis Smith led the inspection of the Cold Creek (Zeneca) site.

At the Cold Creek Site (Zeneca), extraction well CC-14 and most of the monitoring wells were visited. Well CC-14 is equipped with a vertical shaft turbine pump and was discharging 150 gpm. The well appears to be in good condition with no leaks. The well is not equipped with a dropper tube or airline to collect water elevations in the well. The extracted water from well CC-14 was followed through the remediation process. The water is piped to a two column carbon absorption unit where the water is filtered to remove particulates and what

appears to be an iron sludge. After filtering, the water passes through the two carbon columns and is then discharged to the Waste Water Treatment Plant (WWTP). The following observations were made about the carbon adsorption system:

- 2 units in series with 20,000 pounds carbon per column
- units are not back washed, have never had any problems with pressure drop (ΔP) across columns
- criteria for lead column is 5 ppb molinate, when effluent finally exceeded criteria the carbon in the lead tank was replaced and the lag tank became the lead tank.
- ? P across lead column + 11 psi, Δ P across lag column + 1.5 psi
- effluent from the carbon filters is mixed with effluent from the WWTP.

The site inspection team departed the Cold Creek (Zeneca) site and went to the adjacent LeMoyne (Akzo Nobel) site. The site inspection was conducted by Terry Bassett and Sylvia Williams. The site inspection focused on going to many of the monitoring well locations and to all of the intercept wells. Wells IW-1, IW-3, IW-4, and IW-5 were online and pumping when inspected. Well IW-2 was down with a broken shaft for the vertical turbine. The following well observations were made:

- IW-1 - 350 gpm @ 84 psi
- IW-2 - down with a broken shaft
- IW-3 - 450 gpm @ 56 psi, flow meter was surging and erratic
- IW-4 – 325 gpm
- I W-5 – 90 gpm

Wells IW-1 thru IW-4 are equipped with vertical shaft turbine pumps and well IW-5 is equipped with a submersible pump. Well IW-1 was operating and appeared to be in good condition with no leaks and no noticeable vibration in the shaft or electric motor. Well IW-2 was not operational. The vertical turbine shaft to the pump was broken. The well installer was trying to locate and procure a submersible pump to use until the turbine pump could be repaired. Well IW-3 was operating and appeared to be in good condition. Well IW-4 was pumping and appeared to be in good condition, except for a small leak around a shaft seal. A line had been rigged to capture this water and dump it down the dropper tube, used to measure the well water level, so that the leaking water was not discharged onto the ground surface. Well IW-5 was in operation and appeared in good condition.

Records indicate that the system comprised of wells IW-1 thru IW-4, discharging to the GWIP, discharges an average of 1.886 million gallons per day (mgd). Well IW-5 pumps 0.13 mgd. Well CC-14 pumps 0.216 mgd. A total of 2.32 mgd of ground water is being withdrawn, treated and discharged to surface water by the three ground water pump and treat systems that comprise OU-1.

The site inspection team left the site for the day and returned the following morning, July 7, 1999. The remainder of the site inspection consisted of reviewing documents concerning the operation of the pump and treat system.

It was apparent that Akzo and Zeneca do an excellent job of monitoring the pumping system. However, no monitoring of the aquifer is being conducted to insure that the system is capturing the contaminant plume and preventing the migration of contaminants off site. The most usable ground water monitoring data available is the monthly measurements and sampling data from MW-19 and MW-20, which monitor the GWIP and are sampled for carbon tetrachloride and carbon disulfide. This data is particularly useful for the monthly ground water levels.

To satisfy RCRA requirements monitoring wells MW-2 and MW-3, at the Old Chlorine Plant WWTP, and wells O-55 and O-58, at the Old Brine Mud Pond, are monitored semi-annually for mercury. Also, monitoring wells MW-1, MW-2, MW-3, and MW-4, at the Old Chlorine Plant WWTP and wells MW-5, MW-6, NM-1, and NM-2, at the LeMoyne Landfill are monitored semi-annually for carbon tetrachloride. Monitoring wells O-59, O-60, O-61, O-62, O-63, O-64, O81, O-82, O-83, and O-84, at the New Brine Mud Pond, are monitored semi-annually, for mercury, to fulfill the requirements of the RCRA permit. These wells provide some ground water elevation data but do not maintain a detailed record of the ground water elevations at the sites because the reading are not taken frequently enough. See the Attachment C for a plot of the ground water elevations collected from MW-19 and MW-20.

Mike Arnett, EPA RPM, wanted a round of ground water levels collected as a part of the 5-year inspection. Initially, the 64 wells used during the remedial design plus the pumping wells were selected for the ground water level readings. In order to better evaluate the site 11 additional wells were added to the list. Not all of the selected wells were located. The wells not located were installed on the CNA (Acordis) property.

The RPM wanted to ensure that hydraulic capture of the plume was being maintained. To insure that hydraulic capture was being maintained the system needed to be fully operational. Well IW-2 was not operational due to the broken turbine shaft. The decision was made to have Terry Bassett (Akzo Nobel) notify the Corps of Engineers (COE) when the well was repaired and had been operational for at least 5 days. Although it is best if the well readings are collected the same day it was not possible for these sites. Each company involved wanted a responsible employee to participate in the well reading, so scheduling conflicts were avoided by scheduling a day for each site, after conferring with the responsible person. Also, many of the wells had not been opened in several years and problems were anticipated in locating and opening the wells.

The water levels in the wells at the LeMoyne Site (Akzo Nobel) were collected on July 21, 1999. The wells at this site are well marked and well maintained. The wells all had concrete pads and locking protective casings. Most of the wells had bollards.

The wells at the CNA (Acordis) site are not maintained and are generally not labeled. The all of the located wells had concrete pads, none of the wells had locking steel casings or bollards. The exposed PVC casings are showing the effects of prolonged exposure to ultraviolet radiation and are becoming chalky and brittle. According to Nick Burroughs (CNA), Stauffer was given an easement to the CNA property to install the wells, CNA has no responsibility to maintain the wells. Akzo and Zeneca say they did not purchase the wells

from Stauffer Chemical so no one is maintaining the CNA series wells. The water levels in the wells on the CNA property were collected on July 22, 1999. An issue of primary concern during the remedial design was the influence of the water supply wells, located on the CNA property, on the effectiveness of the ground water intercept system. Of five CNA water supply wells monitored during the remedial design and incorporated into the ground water model two are not pumping at this time. Well CNA-3 is not being pumped be cause of low water requirements at the plant and well CNA-5 is broken down and is not scheduled for repair unless water requirements at the plant require the repair.

Well water levels were collected at the Zeneca (Cold Creek) site on July 23, 1999. Mr. Ray Alford (Zeneca) was present during the well measuring process. All of the observed wells at Zeneca had concrete pads and most had bollards. The wells with 4-inch PVC casings did not have lockable steel casings and were not secured with locking plugs. The 2-inch PVC wells had lockable steel casings. Many of the wells were poorly identified, in fact Mr. Alford was repairing the well identification numbers as the wells were read.

After reviewing the water level readings it was decided that eleven additional wells on the western boundary of the sites needed to have the water levels checked. These additional water level readings were collected on July 29,1999.

Based on the water level readings collected, it appears that the intercept well system has developed a well defined inward gradient and associated capture zone and is performing as designed. Wells O-5, O-8, O-26 and O-27 need to be re-measured. These wells are along the west and northwestern side of the site and the measured ground water elevations appear to deviate substantially from the general trend of the area. Water supply well CNA-9 had a measured ground water elevation of – 44.1 ft, ngvd, this is 23.3 feet lower than IW-1 and 19.4 feet lower than IW-4. The effects of CNA-9 need to be evaluated. There is a limited number of monitoring wells in the vicinity and they tend to reflect conditions imposed by the Intercept Well system, wells IW-1 – IW- 3

The water level readings are included as Attachment D , Ground Water Levels.

C. Risk Information Review

The following applicable or relevant and appropriate requirements (ARARs) were reviewed as a part of the 5-year review:

- Federal Maximum Contaminant Levels (MCL's) under the Safe Drinking Water Act
- Surface Water Discharge Requirements of the National Pollution Discharge Elimination System (NPDES) covered under the Clean Water Act (CWA)
- Air emission specifications established by the Clean Air Act (CAA)
- RCRA corrective action and closure requirements
- RCRA Land Disposal Restrictions (LDRs)

Ground water cleanup criteria (including ARAR and health-based levels) are listed in the Table in Section IV A of this report. Of the site contaminants of concern, only three have promulgated MCLs. These are carbon tetrachloride, cyanide and mercury. Of these three, only carbon tetrachloride and mercury had ARAR based MCLs when the ROD was signed. Since the ROD was signed in 1989, an MCL for cyanide has been established as 200 µg/l.

Because the cleanup goals for the remaining contaminants of concern (COCs), at the site, are health-based and not ARAR based, it is recommended that a risk assessment specialist be consulted to determine whether post ROD (1989) toxicological data for the site COCs has changed significantly enough to warrant a change in the cleanup goals established in the ROD.

VI. ASSESSMENT

Based on the results of the site inspection the ground water pump and treat system at the Stauffer Chemical Company sites is protective of human health and the environment. The system appears to have maintained hydraulic capture of the plume and the treatment systems are removing the contaminants.

A. Have conditions external to the remedy changed since the remedy was selected?

The Stauffer Chemical Company sites are still active chemical plants producing a number of organic chemicals and intermediate products. There is no projected change in the land use in the foreseeable future.

The chemicals produced and used are essentially the same as those used when Stauffer owned the sites. Some of the processes have changed, but the possible contaminants are the same. No new sources or pathways were observed during the site inspection.

Hydrogeologic conditions at the site appear to be as stated in the ROD and Remedial Design and the system seems to be operating as designed. The possibility exists that ground water flow parameters may have changed some since the system was installed. Acordis has stopped pumping in two wells, CNA-3 and CNA-5, close to the Akzo site and the intercept well system

B. Has the remedy been implemented in accordance with decision documents?

The sites are active chemical plants with stringently enforced safety rules, practices and emergency action plans. Workers are required to wear any necessary personal protective equipment and have no exposure routes to the contaminated ground water. No HASP or Contingency Plan was noted in the reviewed documents and may not be required at these sites.

The sites are enclosed by fences, with warning signs, and access is through security check points. Institutional controls are in-place and effective to provide for the security of the facilities and to prevent unauthorized access.

The systems are operating as designed. Based on the water elevations collected the system appears to be functioning as designed. No systematic sampling and analysis program is in-place to verify the effectiveness of the system in reducing the level of contaminants. No program to verify containment of the plume is in place. Systematic collection of ground water levels to verify system performance is not being done. No record of any wells being designated as Point of Compliance (POC) wells was noted. As stated in the ROD, the goal at the completion of the remedial action is to meet the ground water cleanup criteria of Table 8.1 (in the ROD) at each of the designated detection monitoring/POC wells and at the extraction wells. Until specific wells are designated as detection monitoring/POC wells, it will not be possible to determine when cleanup goals have been attained and the remedy deemed complete.

The system is well maintained and is in good operating condition. Good O&M plans are in-place for the sites and procedures are in-place for monitoring system operation and performance, as a mechanical system.

Because of the lack of ground water monitoring and sampling, there is no way to consider optimizing the systems performance.

There do not appear to be any early indications of remedy failure. The mechanical systems are well maintained and no history of equipment breakdowns was noted. As previously stated the systems are operated as apart of normal plant operation and the discharges of the systems are closely monitored for compliance with the requirements of the respective NPDES permits. O&M costs are also handled as a part of normal plant operation and no reduction of O&M is anticipated.

C. Has any risk information changed since the remedy was selected?

The wells on the Courtaulds North America (CNA) property, now known as Acordis Cellulosics were installed when Stauffer Chemical Company (SCC) owned the sites. CNA granted SCC an easements to install the wells. The present owners of the SCC property, Zeneca and Akzo Nobel, do not claim ownership of the wells and CNA does not own the wells. These wells are deteriorating and need to be protected. Also, these wells are extremely important in determining the effectiveness of the remediation, and they are the off-site wells.

Reference Doses (RfDs) and Cancer Slope Factors (SF) listed in ROD Table 6.1 (1989) were compared to current values found in IRIS and HEAST. Values listed in the Table were essentially unchanged (note that IRIS now lists an RfD for EPTC of 2.5E-02 instead of 3E-02 and HEAST lists an RfD for pebulate of 5E-02).

The Exposure Factors listed in the ROD Para. 6.1, Table 6.1, and Table 8.1 (a 70 kilogram adult worker consuming 2 liters of water per day for 30 years) are still widely used and accepted by EPA. However, EPA/00/P-95/002Fa (August 1997) Exposure Factors Handbook now lists adult drinking water consumption as 2.3 L/day and adult average body weight as 71.8 kg. The 1991 Standard Default Exposure Factors lists an exposure frequency of 250 days/year and exposure duration of 25 years as the standard exposure factors for a commercial/industrial worker, but workers may have been assumed to have both residential and industrial exposure. All exposure factors were not identified in the ROD, and the basis for using 20% relative source contribution is not known. It is recommended that exposure factors be evaluated to determine if they are still appropriate.

A comparison was made of the 1989 ROD MCLs, Lifetime Health Advisories, and Cancer Slope Factors (SF) or Reference Doses (RfDs) used to calculate health-based cleanup criteria for the sites. No changes have been made to these values since 1989 which would affect evaluation of protectiveness. However, it is recommended that calculated health-based cleanup goals for those chemicals not having MCLs or published LHAs be reevaluated to establish current protectiveness.

TABLE 4

Table Comparing 1989 and 1999 Cancer Slope Factors, Reference Doses, and Goals, and Region 9 Tap Water Screening Values.

CHEMICAL	1989 SF	1989 RfD	1999 SF	1999 RfD	1999	1989 Goal	1989 Basis	1999 Goal	1999 Basis	1999 Reg 9 tap water
						ug/l				ug/l
carbon tetrachloride	1.30E-01		1.30E-01			5	MCL	5	MCL	1.70E-01
carbon disulfide		1.00E-01		1.00E-01	IRIS	0.7	LHA	na		1.00E+03
carbon tetrachloride		7.00E-04		7.00E-04	IRIS	5	MCL	5	MCL	1.70E-01
cyanide (free)						200	LHA	200	MCL	7.3E+02
mercury (inorganic)						2	MCL	2	MCL	
thiocynates*				1.00E-01	NCEA	200	LHA	na		3.70+03
thiocarbamates										
butylate		5.00E-02		5.00E-02	IRIS	350	LHA	350	LHA	1.80E+03
cycloate				na		7***	LHA	na		na
EPTC (EPTAM)		3.00E-02		2.50E-02	IRIS	210	LHA	na		9.10E+02
molinate		2.00E-03		2.00E-03	IRIS	14	LHA	na		7.30E+01
pebulate				5.00E-02	HEAST	7***	LHA	na		1.80E+03
vernolate		1.00E-03		1.00E-03	IRIS	7**	LHA	na		3.70E+01

1989 notes *no health-based number

**pending ODW decision on thiocarbanate LHA values

***based on vernolate (most toxic thiocarbamate at the site (i.e., lowest RfD)

VII. DEFICIENCIES

Deficiencies were observed in the site inspection and are noted in Table 5. Minor deficiencies include unlocked wells and unlabeled wells. Other deficiencies involve the failure to monitor the effectiveness of the system as required by the ROD. Luckily, it does not appear that the system has failed to provide the required protectiveness to the environment and for human health.

TABLE 5

Deficiencies	Currently Affects Protectiveness **(Y/N)**
Monitor wells at Zeneca and CNA do not all have locking steel protective casings or bollards.	**N**
Monitor wells at some locations are not labeled with well no., etc.	**N**
Monitoring wells are not being used to monitor the system to determine its' effectiveness and to verify plume capture.	**Y**
Shutting down extraction well system at Akzo Nobel to collect samples from MW-19 & MW-20	**N**
Monitoring wells are not being sampled to verify the progress of the cleanup	**Y**

VIII. RECOMMENDATIONS

In order to evaluate the performance of the ground water extraction system, measure the performance of the whole pump and treat system, and insure the protectiveness of the remedy the following recommendations are made.

TABLE 6

Recommendations/ Required Actions	Party Responsible	Oversight Agency	Required Actions: Currently Affects Protectiveness **(Y/N)**
Redevelop and function test all monitoring wells.	Akzo/ Zeneca	EPA	**N**
Collect a complete round of water level measurements and construct a potentiometric map of the sites.	Akzo/ Zeneca	EPA	**Y**
Use the new data to calibrate the ground water model (MODFLOW) and check model predictions.	Akzo/ Zeneca	EPA	**Y**

Designate detection monitoring/POC wells	Akzo/ Zeneca	EPA	**N**
Start quarterly collections of water leverls on all, or selected, wells and maintain current plots of readings and an updated potentiometric map. All water levels should be collected on the same day.	Akzo/ Zeneca	EPA	**Y**
Institute a quarterly sampling program for POC wells.	Akzo/ Zeneca	EPA	**N**
Install dedicated samplers at MW 19 & MW-20 so that extraction system does not have to be shut down. Take blank samples of deionized water to the field and open containers while sampling MW-19 & MW-20 with system operation, analyze DI samples for contamination	Akzo	EPA	**N**
Institute a review program to see if any monitor wells can be closed/abandoned.	Akzo/ Zeneca	EPA	**N**
At the next scheduled maintenance install a drop tube in CC-14.	Zeneca	EPA	**N**
Maintain access to wells in Cold Creek Swamp.	Zeneca	EPA	**N**
Locate, label and protect monitor wells on former CNA property.	Akzo/ Zeneca	EPA	**N**

IX. PROTECTIVENESS STATEMENT

The remedy at OU-1 appears to be protective of human health and the environment. The water level data collected as a part of this site inspection indicates that the system maintains an inward gradient and appears to be capturing the plume. Without any water level data or any monitoring well sample data it is not possible to evaluate the performance of the system.

X. NEXT REVIEW

This is a statutory site that will require ongoing 5-year reviews. The next review should be conducted within 5 years from the completion of this 5-year review report. The completion date is the date of the signature shown on the signature cover attached to the front of this report.

Attachments

Attachment A: Documents Reviewed
Attachment B: Site Maps
Attachment C: Well Data
Attachment D: Water Level Readings
Attachment E: Photographs

ATTACHMENT A

DOCUMENTS REVIEWED

1. Record of Decision, Ground Water Operable Unit, Stauffer Chemical, Company Sites, Axis and Bucks, AL, USEPA, September 27, 1989.

2. Remedial Design/Remedial Action Statement of Work For the Stauffer Chemical Company Site, Mobile, County, AL, Camp, Dresser & McKee, December 15, 1989.

3. Remedial Design Work Plan for the Stauffer Chemical Co. Sites, Axis and Bucks, Alabama, Ref. Consent Decree File No. 90-0162-B-C, Geraghty & Miller, 1990.

4. Preliminary Design Report Stauffer Chemical Company Sites, Ground-Water Operable Unit, Volumes I, II & III, Geraghty & Miller, January 1992, prepared for Akzo Chemicals and ICI Americas.

5. Akzo Nobel Chemicals, Inc., LeMoyne Plant, Groundwater Intercept and Treatment System, Operations and Maintenance Plan, 1 July 1996, revised September 5, 1996.

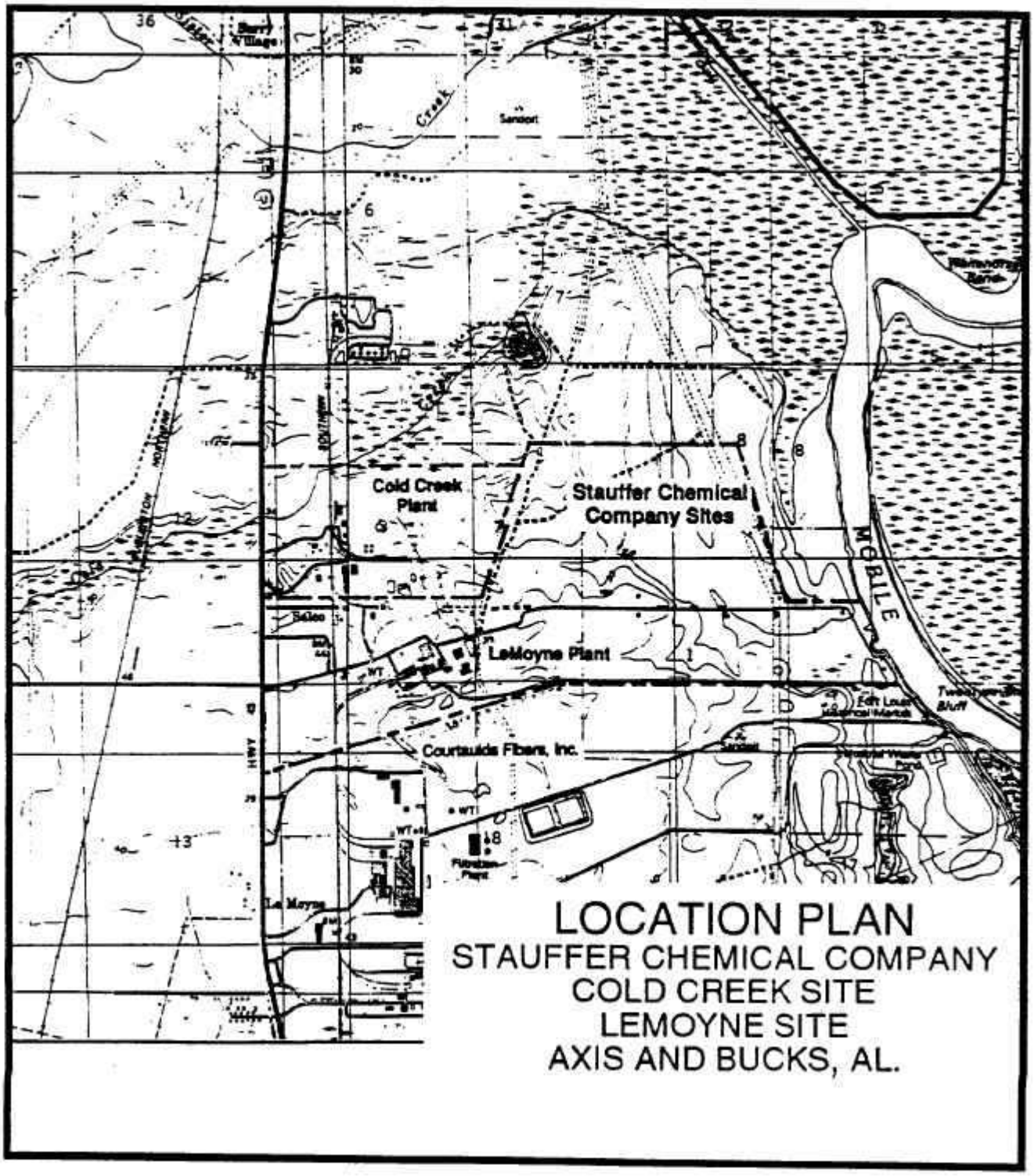
6. Zeneca, Cold Creek, AL, Remedial Action Work Plan, Groundwater Improvement System, October, 1993.

7. Zeneca, Revised Remedial Action Work Plan, Groundwater Improvement System, December, 1993.

8. Draft Comprehensive Five-Year Review Guidance, EPA 540R-98-050, USEPA, April 1999

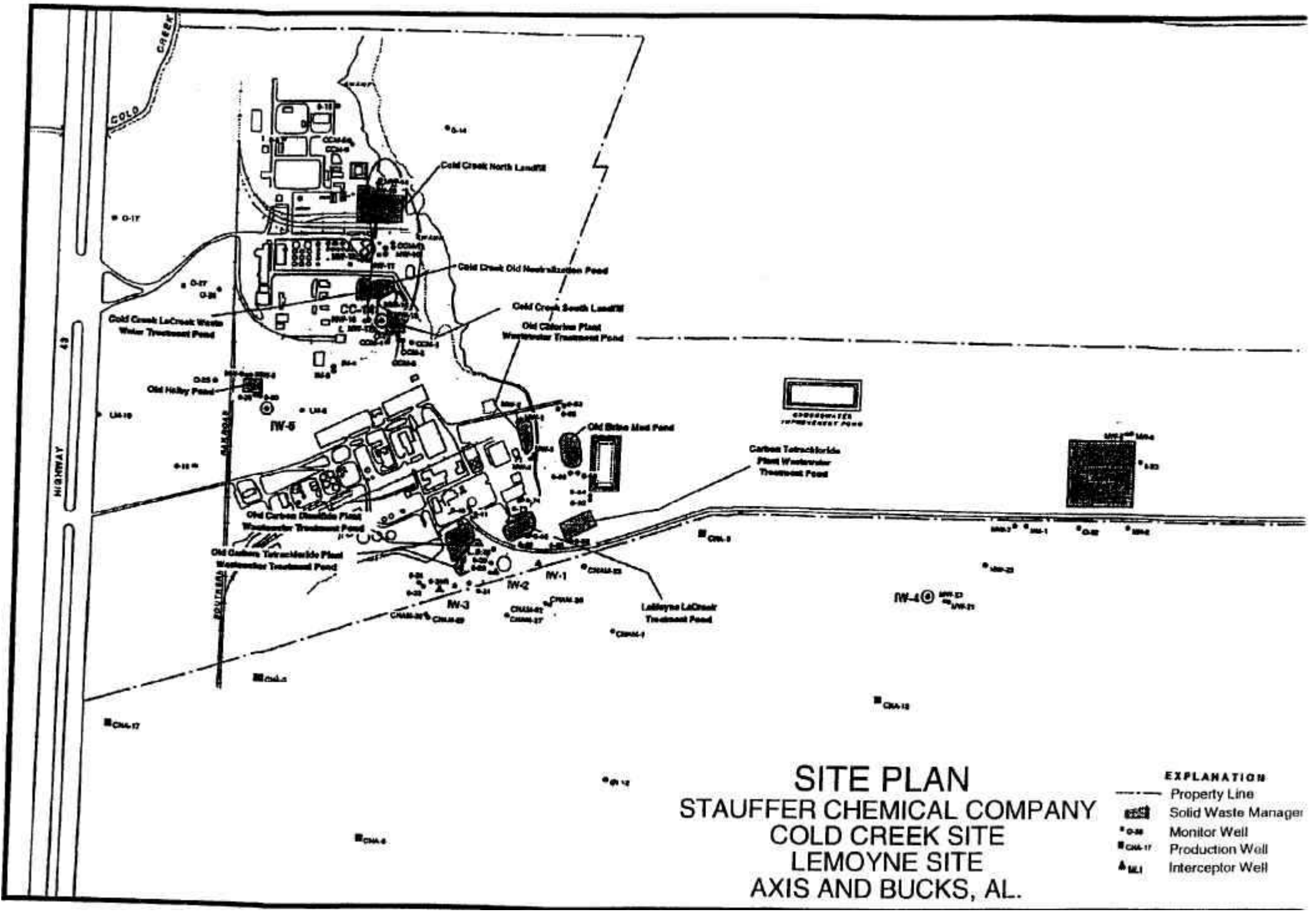
ATTACHMENT B

SITE MAPS



LOCATION PLAN

STAUFFER CHEMICAL COMPANY
COLD CREEK SITE
LEMOYNE SITE
AXIS AND BUCKS, AL.



SITE PLAN
STAUFFER CHEMICAL COMPANY
COLD CREEK SITE
LEMOYNE SITE
AXIS AND BUCKS, AL.

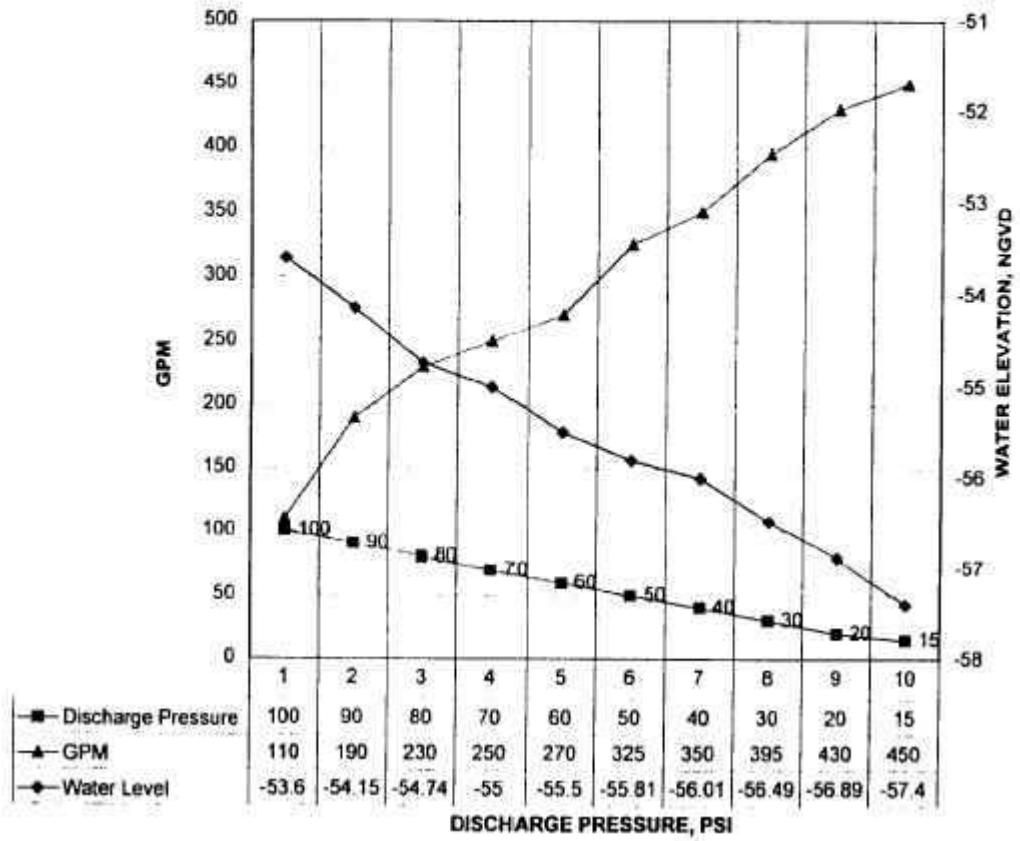
EXPLANATION

- Property Line
- Solid Waste Manager
- Monitor Well
- Production Well
- Interceptor Well

ATTACHMENT C

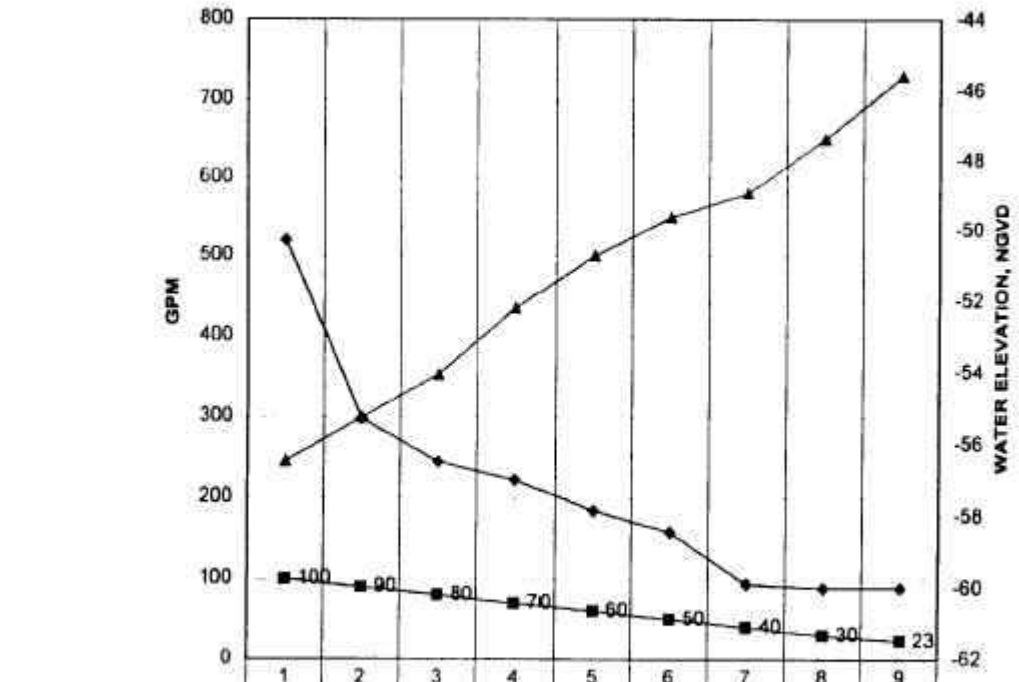
WELL IW-2 PERFORMANCE BEFORE AND AFTER CLEANING

WELL IW-2 PERFORMANCE BEFORE CLEANING



	1	2	3	4	5	6	7	8	9	10
Discharge Pressure	100	90	80	70	60	50	40	30	20	15
GPM	110	190	230	250	270	325	350	395	430	450
Water Level	-53.6	-54.15	-54.74	-55	-55.5	-55.81	-56.01	-56.49	-56.89	-57.4

WELL IW-2 PERFORMANCE AFTER CLEANING



	1	2	3	4	5	6	7	8	9
Discharge Pressure	100	90	80	70	60	50	40	30	23
GPM	245	300	353	435	500	549	580	650	730
Water Level	-50.3	-55.3	-56.5	-57	-57.85	-58.45	-59.89	-60	-60

DISCHARGE PRESSURE, PSI

ATTACHMENT D

GROUNDWATER LEVELS

GROUNDWATER ELEVATIONS FOR SELECTED WELLS
STAUFFER CHEMICAL CO. SITES 5-YEAR REVIEW

Well		Screened Interval		TOC	Depth to	Groundwater			
Number	Location	From	To	Elevation	Groundwater	Elevation	Date	TD	
CCM-1	Zeneca	61	71	28.49	35.59	-7.1	07/23/99	76.00	
CCM-2	Zeneca	55	65	32.07	39.15	-7.08	07/23/99	69.00	
CCM-3	Zeneca	97	117	32.79	39.85	-7.06	07/23/99	119.00	
CCM-4	Zeneca	59	79	40.29	47.41	-7.12	07/23/99	80.00	
CCM-5	Zeneca	60	70	28.45	30.51	-2.06	07/23/99	74.00	
CCM-6	Zeneca	98	108	28.04	30.13	-2.09	07/23/99	111.00	
CCM-7	Zeneca	59	69	33.23	37.62	-4.39	07/23/99	73.00	
CNA-13	Courtaulds				83		07/22/99		Pumping
CNA-17	Courtaulds				82		07/22/99		Pumping
CNA-3	Courtaulds	95	125					131.00	Not pump.
CNA-5	Courtaulds				57.05		07/22/99		Not pump.
CNA-9	Courtaulds	92	122	43.91	88	-44.09	07/22/99	130.00	Pumping
CNAM-1	Courtaulds	60	70	37.25				70.00	Not found
CNAM-22	Courtaulds	106	126	41.77	55.99	-14.22	07/22/99	130.00	
CNAM-23	Courtaulds	67	117	36.34	50.23	-13.89	07/22/99	119.00	
CNAM-27	Courtaulds	81	131	45.89	56.81	-10.92	07/22/99	132.00	
CNAM-28	Courtaulds	46	69	41.81	55.87	-14.06	07/22/99	71.00	
CNAM-29	Courtaulds	54	84	40.87	53.42	-12.55	07/22/99	85.00	
CNAM-30	Courtaulds	108.5	128.5	41.26	53.88	-12.62	07/22/99	132.00	
MW-1	Akzo	105	115	28.64	37.76	-9.12	07/21/99	117.00	
MW-10	Zeneca	102.5	112.5	32.68	37.57	-4.89	07/23/99	121.00	
MW-11	Zeneca	113	123	36.07	42.38	-6.31	07/23/99	127.00	
MW-12	Zeneca	50	60	36.28	41.42	-5.14	07/23/99	60.00	
MW-13	Zeneca	44	54	27.61	31.19	-3.58	07/23/99	55.00	
MW-14	Zeneca	99	109	26.92	30.09	-3.17	07/23/99	113.20	
MW-15	Zeneca	106.4	116.4	34.56	41.43	-6.87	07/23/99	124.00	
MW-16	Zeneca	42.5	52.5	34.68	41.31	-6.63	07/23/99	54.00	

GROUNDWATER ELEVATIONS FOR SELECTED WELLS
STAUFFER CHEMICAL CO. SITES 5-YEAR REVIEW

Well		Screened Interval		TOC	Depth to	Groundwater			
Number	Location	From	To	Elevation	Groundwater	Elevation	Date	TD	
MW-17	Zeneca	113.7	123.7	39.07	45.81	-6.74	07/23/99	128.70	
MW-18	Zeneca	54	64	38.98	45.61	-6.63	07/23/99	65.00	
MW-20	Akzo	61	71	46.24	54.91	-8.67	07/21/99	75.00	
MW-3	Akzo	45	55	31.2	41.8	-10.6	07/21/99	55.00	
MW-4	Akzo	108	114	31.05	41.06	-10.01	07/21/99	118.00	
MW-5	Akzo	75	85	11.76	13.62	-1.86	07/21/99	86.00	
MW-6	Akzo	16.3	26.3	12	13.63	-1.63	07/21/99	27.50	
MW-7	Akzo	84	94	46.75	54.95	-8.2	07/21/99	100.00	
MW-8	Akzo	119	129	44.58	52.12	-7.54	07/21/99	134.00	
MW-9	Akzo	55	65	44.54	52	-7.46	07/21/99	70.00	
NM-1	Akzo	44	59.5	46.91	55.03	-8.12	07/21/99	62.50	
NM-2	Akzo	19	34	24.91	27.81	-2.9	07/21/99	37.00	
O-14	Zeneca	89	109	31.8	33.85	-2.05	07/23/99	120.00	
O-20R	Akzo	55	85	36.42	50.22	-13.8	07/21/99	86.00	
O-23	Akzo	38	58	13.48	15.08	-1.6	07/21/99	80.00	
O-29	Akzo	58	88	35.64	49.97	-14.33	07/21/99	90.00	
O-30	Akzo	97	117	35.96	51.83	-15.87	07/21/99	126.00	
O-31	Akzo	98	118	38.42	52.47	-14.05	07/21/99	126.00	
O-33	Akzo	95	125	37.35	49.9	-12.55	07/21/99	129.00	
O-34	Akzo	68	88	37.18	49.32	-12.14	07/21/99	90.00	
O-40	Akzo	99	119	34.87	46.37	-11.5	07/21/99	124.00	
O-41	Akzo	69	89	35.44	46.95	-11.51	07/21/99	91.00	
O-48	Akzo	100	120	32.45	45.55	-13.1	07/21/99	123.00	
O-49	Akzo	59	79	33.19	46.53	-13.34	07/21/99	81.50	
O-53	Akzo	104	123	35.41	44.57	-9.16	07/21/99	125.00	
O-55	Akzo	46	56	34.18	43.39	-9.21	07/21/99	57.00	
O-56	Akzo	103	113	30.44	41.53	-11.09	07/21/99	116.50	

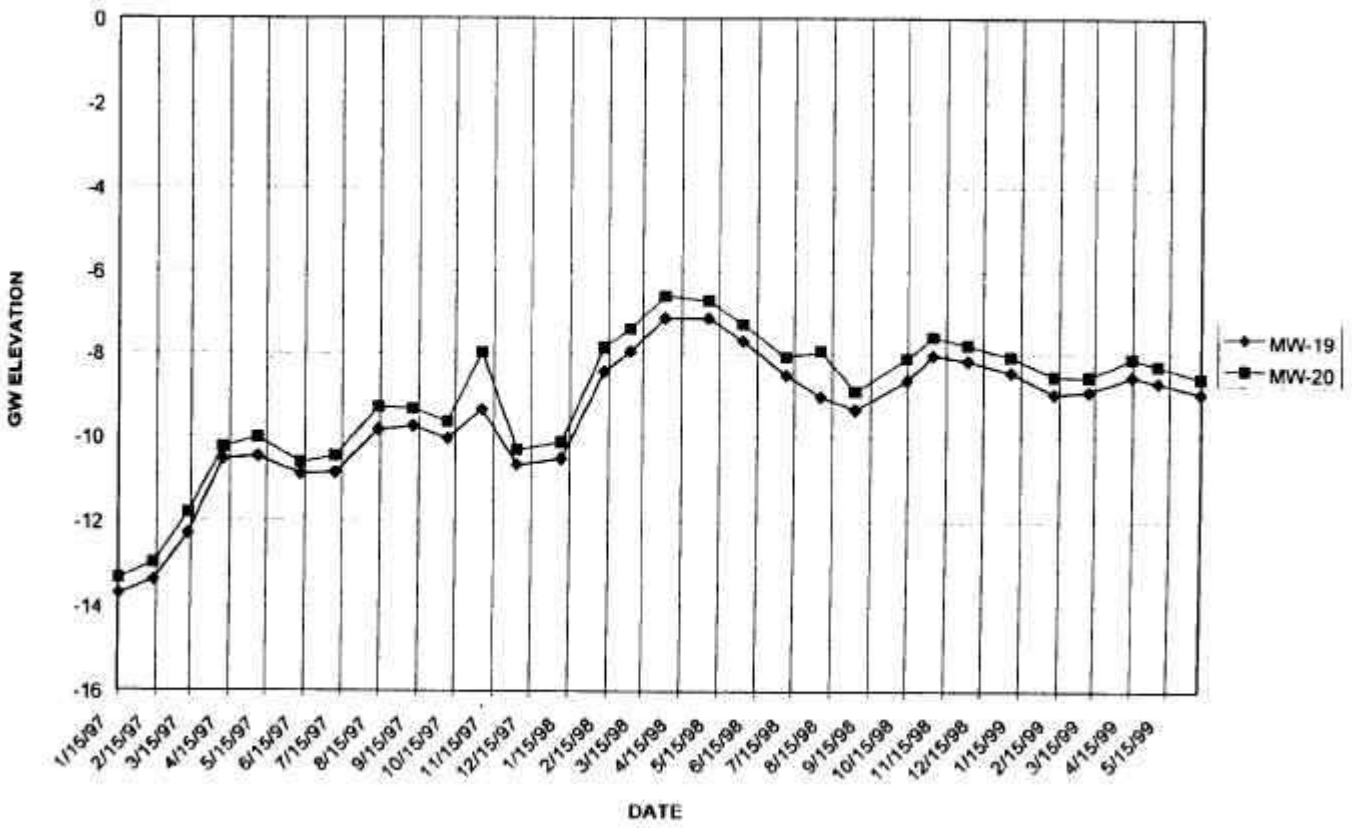
GROUNDWATER ELEVATIONS FOR SELECTED WELLS
STAUFFER CHEMICAL CO. SITES 5-YEAR REVIEW

Well		Screened Interval		TOC	Depth to	Groundwater			
Number	Location	From	To	Elevation	Groundwater	Elevation	Date	TD	
O-58	Akzo	51	61	28.86	39.87	-11.01	07/21/99	64.00	
O-65	Akzo	68	78	36.01	49.61	-13.6	07/21/99	80.00	
O-66	Akzo	97	117	36.83	50.38	-13.55	07/21/99	120.50	
O-73	Akzo	70	90	33.92	45.61	-11.69	07/21/99	93.00	
O-74	Akzo	98	118	34.19	45.97	-11.78	07/21/99	120.00	
O-79	Akzo	68	78	44.32	52.15	-7.83	07/21/99	80.00	
O-80	Akzo	98	118	44.08	51.9	-7.82	07/21/99	132.00	
O-83	Akzo	47.5	62.5	36.02	47.31	-11.29	07/21/99	65.00	
O-84	Akzo	97.5	112.5	36.31	48.22	-11.91	07/21/99		
OW-2	Courtaulds								
O-5	Zeneca	30	74	34.92	23.58	11.34	07/29/99	120.00	
O-5	Zone 2	97	117						
O-8	Zeneca	100	115	34.73	63.13	-28.4	07/29/99	122.00	
O-16	Zeneca	32	72	30.87	30.89	-0.02	07/29/99	130.00	
O-18	Akzo	54	135	45.27	51.65	-6.38	07/29/99	140.00	
O-25	Akzo	108	128	47.24	54.25	-7.01	07/29/99	131.00	
O-26	Zeneca	50	90	46.85	37.41	9.44	07/29/99	133.00	
O-26	Zone 2	110	130						
O-27	Zeneca	119	134	45.82	75.5	-29.68	07/29/99	137.00	
O-46	Akzo	106	126	39.07	49.46	-10.39	07/29/99	127.00	
O-47	Akzo	71	91	39.29	49.42	-10.13	07/29/99	92.00	
O-67	Akzo	54	74	26.55	34.71	-8.16	07/29/99	77.00	
O-68	Akzo	96	116	26.76	34.86	-8.1	07/29/99	119.00	
IW-1	Akzo	69	119	36.42	57.2	-20.78	07/21/99	119.00	
IW-2	Akzo	72	122	37.06	No access to read well			122.00	
IW-3	Akzo	74	124	36.01	53.5	-17.49	07/21/99	124.00	
IW-4	Akzo	73	83	48.61	73.37	-24.76	07/21/99	128.00	

GROUNDWATER ELEVATIONS FOR SELECTED WELLS
STAUFFER CHEMICAL CO. SITES 5-YEAR REVIEW

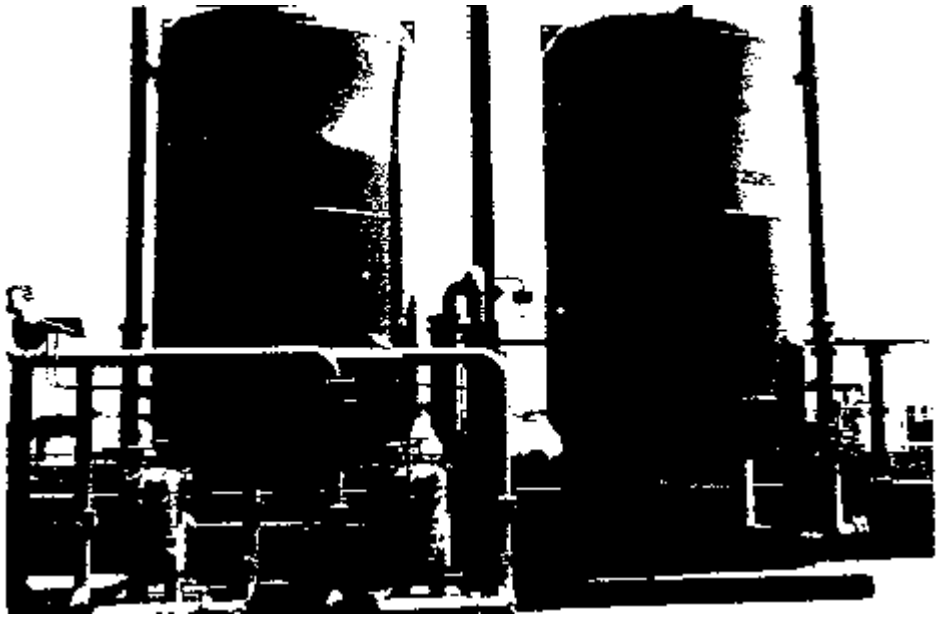
IW-4	Zone 2	93	123						
IW-5	Akzo	68.1	88.1	45.67	54.5	-8.83	07/29/99	95.00	

GW LEVELS FOR MW-19 & MW-20



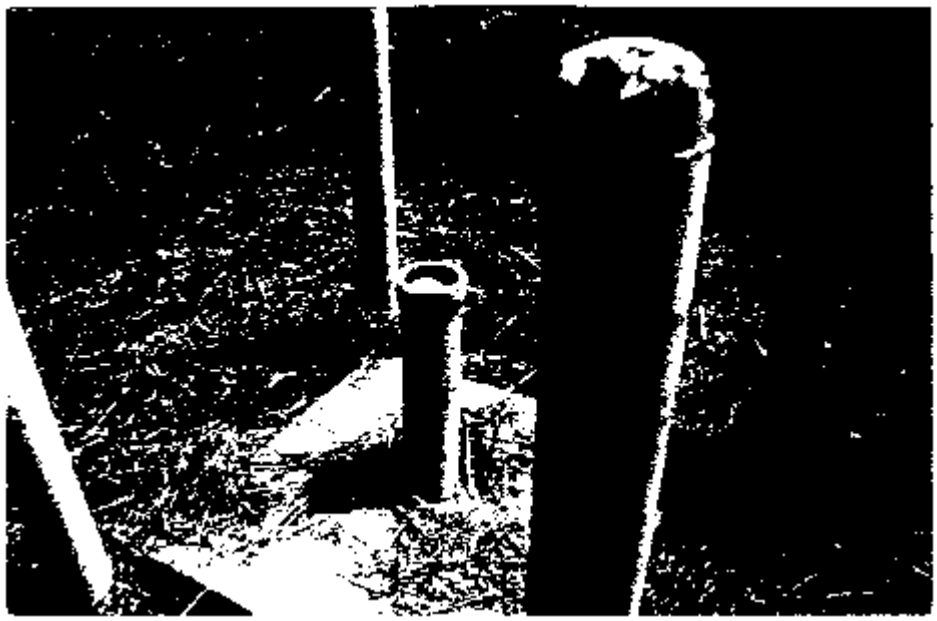
ATTACHMENT E
PHOTOGRAPHS

WELL CC-14 AT ZENECA (COLD CREEK SITE)



CARBON COLUMNS FOR COLD CREEK SITE WATER TREATMENT SYSTEM

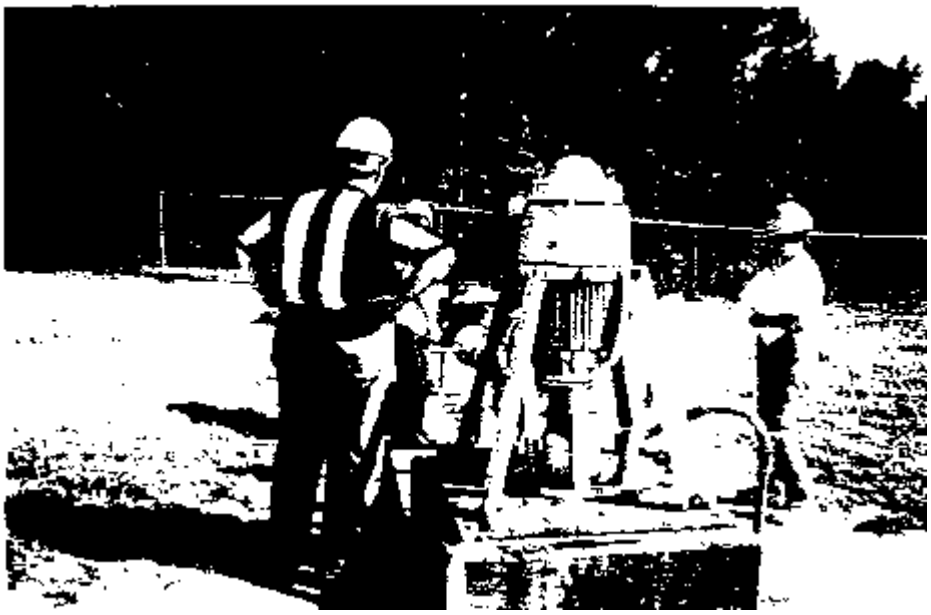
PARTICULATE PRE-FILTERS FOR GROUND WATER TREATMENT SYSTEM



TYPICAL 2-INCH WELL AT ZENECA

WELL IW-5 HALBY POND, AKZO NOBEL (LeMOYNE SITE)

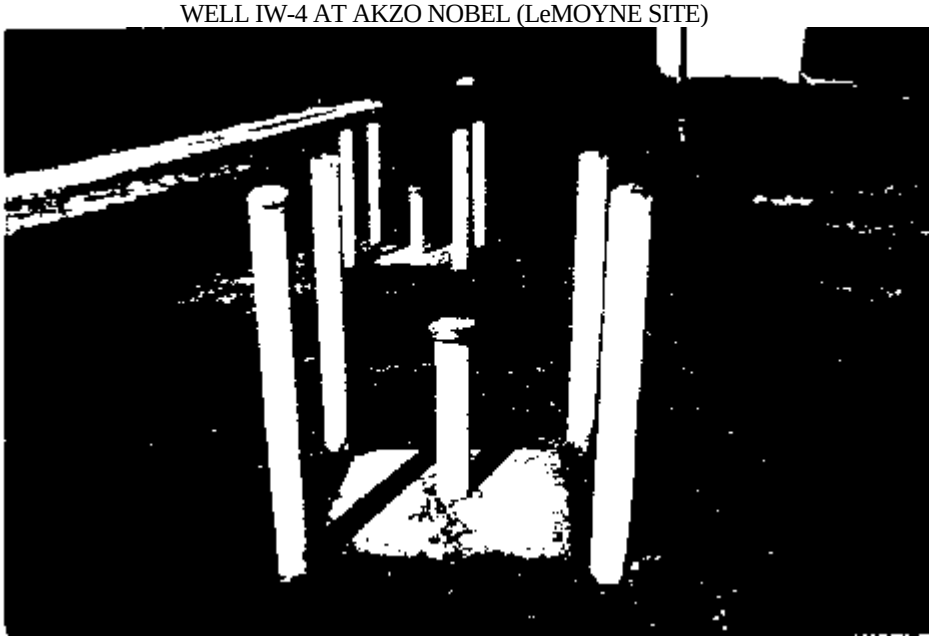
WELL IW-1 AT AKZO NOBEL (LeMOYNE SITE)



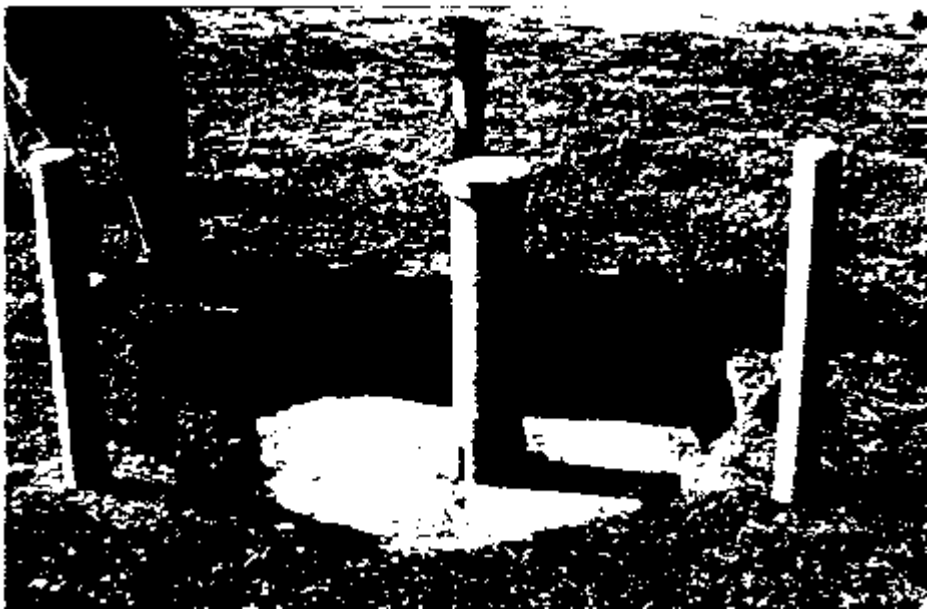
WELL IW-2 AT AKZO NOBEL (LeMOYNE SITE)

WELL IW-3 AT AKZO NOBEL (LeMOYNE SITE)

WELL IW-4 AT AKZO NOBEL (LeMOYNE SITE)



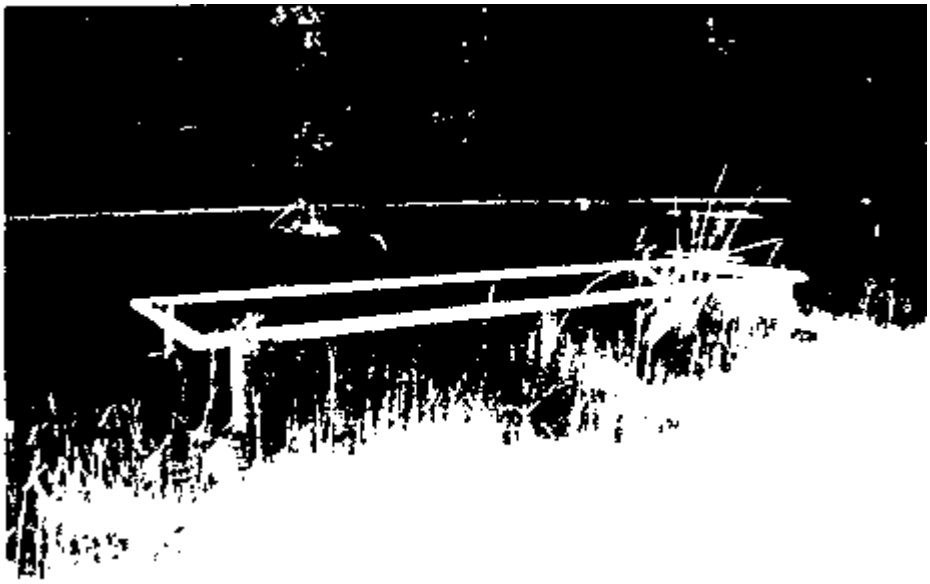
MW-1 & MW-2, TYPICAL 2-INCH WELL INSTALLATIONS AT AKZO



TYPICAL 4-INCH WELL INSTALLATION AT AKZO

GROUND WATER IMPROVEMENT POND AT AKZO (LeMOYNE SITE)

SRAY NOZZLES AT GROUND WATER IMPROVEMENT POND



BARRICADE AROUND CLEAN-OUT PORT ON IW-4 DISCHARGE LINE